

Earth's Biological History

8.2 The student will demonstrate an understanding of Earth's biological diversity over time. (Life Science, Earth Science)

8-2.6 Infer the relative age of rocks and fossils from index fossils and the ordering of rock layers.

Taxonomy level: 2.5-B Understand Conceptual Knowledge

Previous/Future knowledge: The concept of relative age using ordering of rock layers and index fossils is new content for this grade. This concept will be further studied in high school Earth Science.

It is essential for students to know that the *relative age* means the age of one object compared to the age of another object. Relative age does not tell the exact age of an object. The relative age of rocks and fossils can be determined using two basic methods: ordering of rock layers and index fossils:

Ordering of Rock Layers

- Scientists read the rock layers knowing that each layer is deposited on top of other layers.
- The *law of superposition* states that each rock layer is older than the one above it.
- So using this layering, the relative age of the rock or fossil in the rock is older if farther down in the rock layers.
- Relative dating can be used only when the rock layers have been preserved in their original sequence.

Index Fossils

Certain fossils, called index fossils, can be used to help find the relative age of rock layers. To be an index fossil –

- an organism must have lived only during a short part of Earth's history;
- many fossils of the organism must be found in rock layers;
- the fossil must be found over a wide area of Earth;
- the organism must be unique.

The shorter time period a species lived, the better an index it is. A key example of an organism used as an index fossil are *trilobites*, a group of hard-shelled animals whose body had three sections, lived in shallow seas, and became extinct about 245 million years ago. Therefore, if a trilobite is found in a particular rock layer, it can be compared with trilobites from other layers to estimate the age of the layer in which it was found.

Fossils that are found in many rock layers, therefore living long periods of time, do not qualify as index fossils.

It is not essential for students to know how to interpret complex layering due to intrusions and extrusions, faults, or unconformities, although some students may be challenged with this task. Complex layering is part of the high school Earth Science course. It is also not essential for students to know the processes involved in absolute dating using radioactive element decay.

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Assessment Guidelines:

The objective of this indicator is to *infer* the relative age of rocks and fossils; therefore, the primary focus of assessment should be to draw conclusions about relative age from presented material on layering of rocks and index fossils. However, appropriate assessments should also require students to *interpret* drawings or diagrams that show data about rock layers and fossils; *compare* rock layers in order to determine common points of relative time; or *recall* the law of superposition.